# AQUATIC
## INFORMATICS™

FASTER ANALYSIS.BETTER DECISIONS.

# Upgrading to AQUARIUS 3.0

## Taking the Plunge

# Contents

## 1 Welcome

So, you are about to make the big switch to AQUARIUS 3.0.  Congratulations!  Here is a short primer on what you need to know and what you should expect.

## 2 There is now an application server

The main feature of AQUARIUS 3.0 is the introduction of the AQUARIUS Server.  This software runs on a Windows server machine and is the heart of the new system.  All access to the database is directed through the server.  The server is also responsible for scheduling tasks, running automation, and sending notifications.
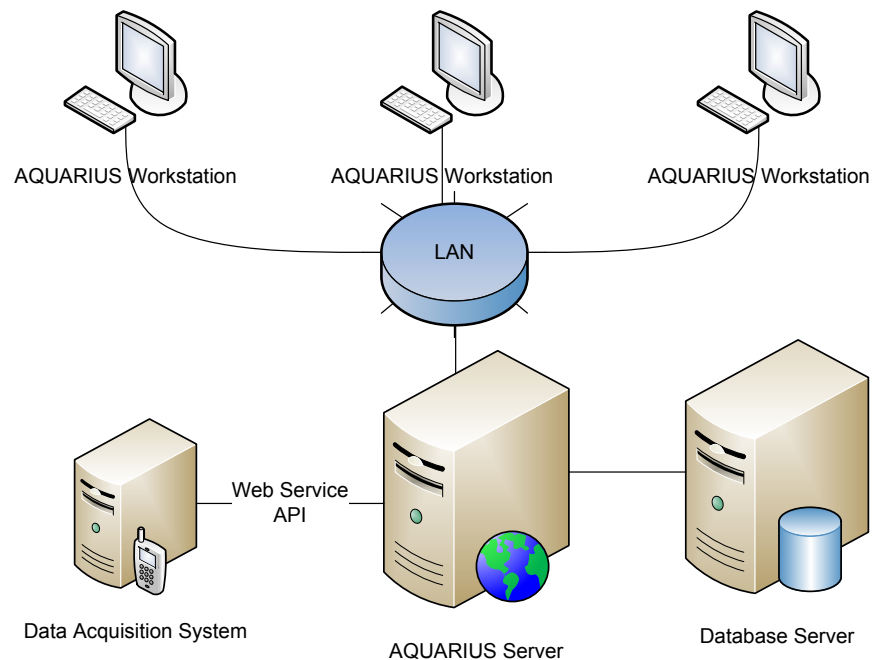
## 3 There is a new user interface

AQUARIUS 3.0 introduces a new user interface called AQUARIUS Springboard. The whiteboard interface that we all know and love is still there, but the new Springboard interface is optimized for working with the AQUARIUS Server. Springboard gives you a view of all your Locations and data sets and lets you quickly run AQUARIUS toolboxes without using the whiteboard. It is perfect for daily tasks such as Data Correction, Rating Curve Development, Logger File Append, and so on (more on these tools below).
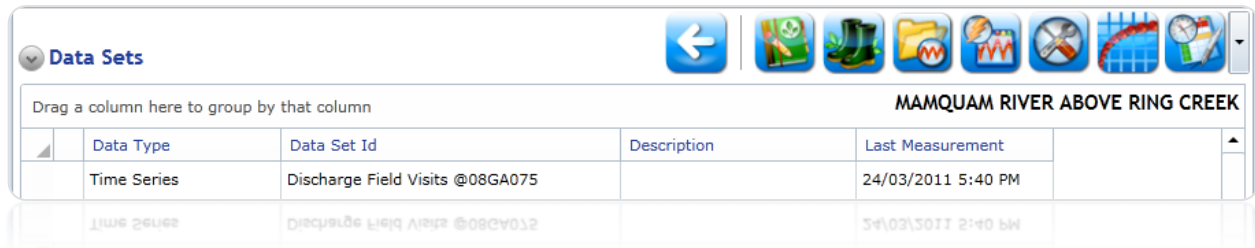


Springboard runs in a web browser and interacts with the exact same toolboxes you already have installed as part of AQUARIUS Workstation.

## 4 The database is expanded

The AQUARIUS 3.0 database is a lot larger than that in 2.7. The same core tables are still there (AQAtom_TimeSeries and its friends) but there are many more tables for specialized purposes.
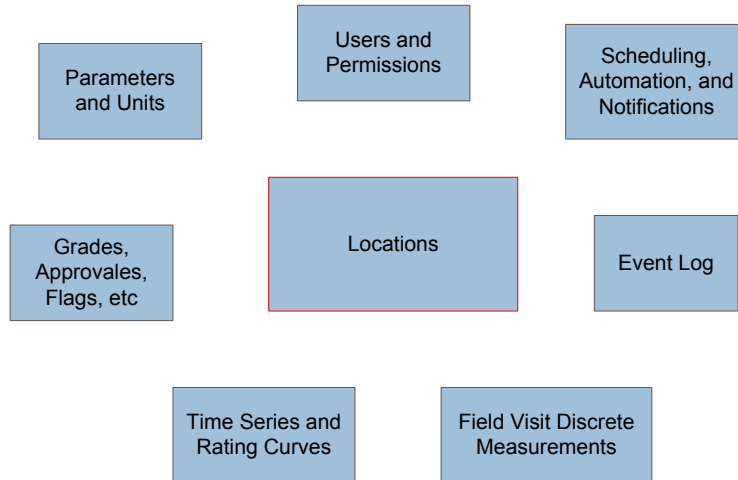
At the conceptual center of the AQUARIUS 3.0 database is the LOCATION table.  A location is a physical place (ie lat/long/elevation) where data is collected.  Locations can be grouped into a hierarchy, but only locations can contain data sets.

Settings that used to be stored on each workstation are now centralized.  Things like Parameters, Units, Grades, Flags and Report Definitions are now managed in one place and accessed from each client.

The new database also contains tables for managing users and their data access rights, automation settings, field visit data, system logs, and much else.

## 5 Time series can be automatically derived and kept up to date

One of the most important functions of the AQUARUIUS Sever is to automatically derive data and keep it up to date.  For example, if you use a rating curve to derive a discharge time series from Stage data, AQUARIUS can now automate this process so that any changes to the source data or rating curve will automatically trigger a recalculation of the discharge signal.

There are three different types of derived time series:

| Composite Time Series | Derived from the content of another time series.  For example, you could create a Stage Working signal that is usually derived |
|---|---|

| | from the Stage Telemetry signal.  However you could modify the "source" to begin deriving data from a different signal (eg Stage Logger) if telemetry is unavailable for a while.  [Note that changing the source signal does not affect previously derived data, only newly appended data going forward] |
|---|---|
| Field Visit Time Series | If you want to turn field measurements of a certain parameter into a time series (for use as a surrogate signal in Data Correction for example), you can do it here. |
| Time Series From Rating Curve | This is the standard setting to set up an automatic Discharge signal.  You identify the source time series and the rating curve. |

## 6 You can create automatic corrections that fix data as it arrives

AQUARIUS 3.0 allows you to create *open-ended* corrections that apply to existing data as well as future data.  This is a very simple and powerful mechanism to standardize time series and streamline data acquisition.   Typical problems like an orifice shift or basic spike removal are easy to set up.  As always, AQUARIUS does not actually modify the raw data, but the corrected signal will automatically show the fixed data.

## 7  The system can notify you if bad things happen

As part of setting up a location in the system, you are able to configure notification rule-sets that watch incoming data for various conditions.   If a condition occurs AQUARIUS will email you the details and add flags to the data set so you can see what it is complaining about.

It is possible to have multiple rule-sets configured for the same time series, each rule-set watching for different values.  For example you could have:

1. "*If data exceeds threshold of 6.1m, email Joe Schmoe*"  and
2. "*If data exceeds threshold of 6.3m email Big Boss*".

For rule-sets that watch for the *absence* of data (eg no appends in last 6 hrs) you can configure the check to run on a schedule such as "once a day".

In addition, any notifications that are triggered in the system result in a new entry in the system LOG. When you are in Springboard, these log entries are scanned for the worst thing that has happened in the last 24 hours and that status is shown for each location. This is a great way to quickly find which locations are having problems that you care about.



## 8 Data access can be controlled by roles and approval levels

To gain access to the AQUARIUS Server you need to log in with a username and password. An administrator can set up *user roles* that limit what kind of changes you can make to data and locations. Once it knows who you are, the system figures out what role you have been assigned for each location and applies restrictions accordingly.

## 9 There is a new tool for appending logger files to time series

When you return from the field with a new logger data file that you want to append to a time series, you can now use a specialized tool. The Append Logger File tool in AQUARIUS Springboard streamlines the

process, allowing you to set up a mapping for which data-stream in the file is associated with which time series in AQUARIUS.

The tool also has a great "undo" feature that allows you to back out an append that was made in error. If you undo an logger file append then the data will be removed from each AQUARIUS time series that received new data as well as any derived time series that were re-calculated as a result.

## 10 You can create Hot Folders for automating logger file appends

Once you have figured out how to append logger files into time series at a location, you may want to automate it. For this you can set up a hot folder that the system watches for files. When files are dropped into the folder the append rules are applied and the file is processed.

## 11 There is a new tool for entering discrete field visit measurements

AQUARIUS 3.0 also introduces a whole new framework for managing discrete measurements taken in the field. The Field Visit Tool allows you to ingest common measurement files (Flowtracker, WinRiver, etc) as well as enter data manually. The tool tracks each individual field activity, automatically attaches the file, and provides a collection of visualization tools for analyzing the data. Observations can be aggregated into discrete results which can then be used for building rating curves or calibrating time series.

Field visit observations stored in the database can be used in several ways. They are available to the AQUARIUS Reporting engine for generating location analysis reports, they are available in Rating Curve Development toolbox for managing ratings, and they can be derived into time series for use in Data Correction toolbox as surrogate signals and corroborations.
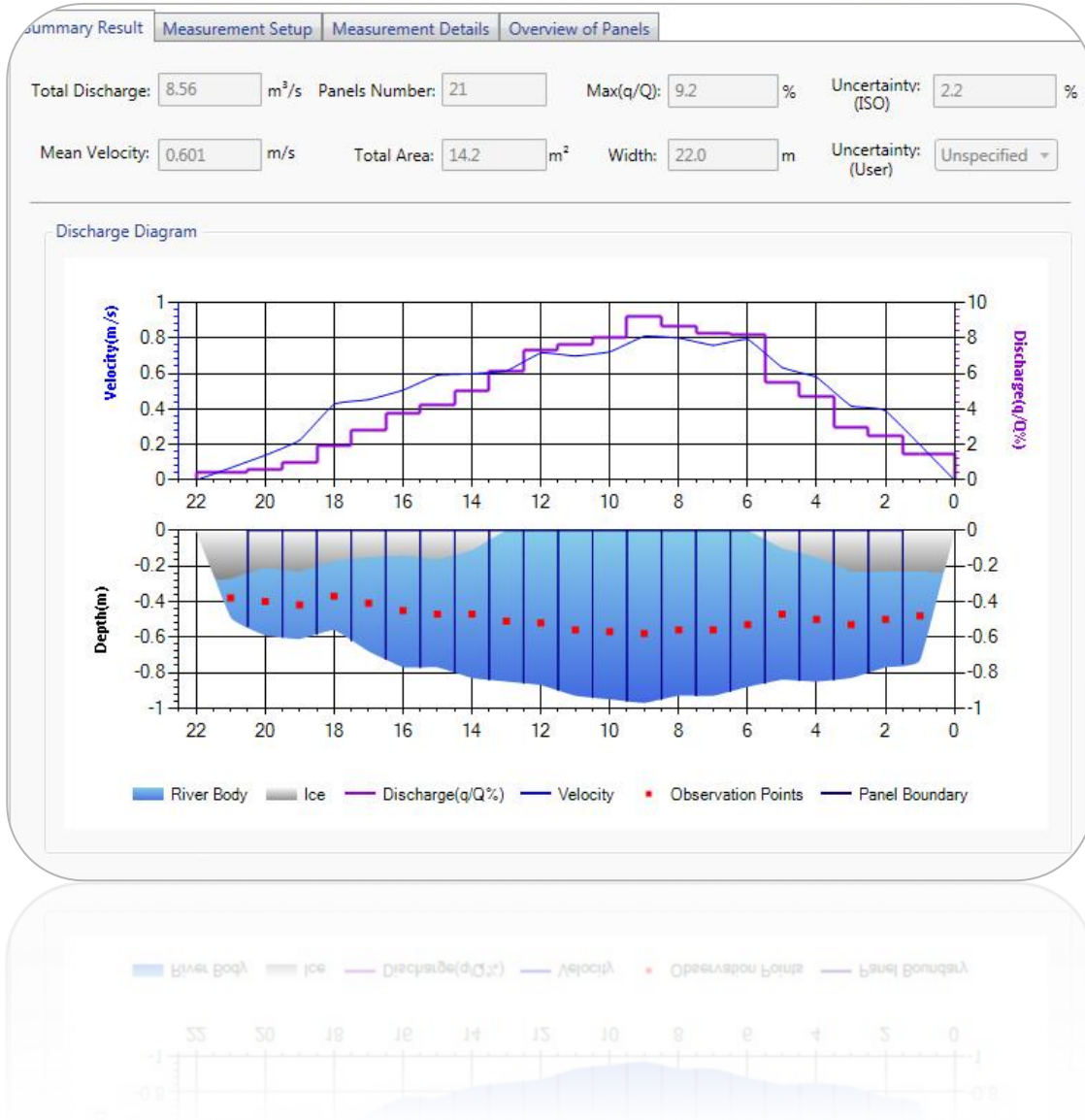
## 12 The read and write to database toolboxes are changed

AQUARIUS 3.0 introduces new whiteboard toolboxes for reading data from the server and for writing it back. The toolboxes are "mini" versions of AQUARIUS Springboard, which provide consistent and familiar navigation tools for finding data.

- *Read From Database* becomes *Read From Server*
- *Write To Database* becomes *Write To Server*

A happy side effect of this change is that AQUARIUS Data Source files are no longer required for connecting to the system.

## 13 Database stored procedures are replaced by web services

Under the covers, the way that external systems interact with AQUARIUS is changed. The AQUARIUS Server has two rich application programming interfaces (APIs) that can be used to get data in and out of the system.

The *AQAcquisition Service* is a SOAP-based webservice that provides access to external systems for pushing data into the system. Using this service you can create time series, append new data, add field visit measurements, and other similar things.

The *AQUARIUS Publish Service* is a SOAP- or REST-based webservice that provides access to external consumers for getting data out of the system. Using this service you can get a time series, get a rating table, or generate a report. The service is optimized for external systems that need to synchronize with AQUARIUS and provides methods to retrieve only changed data, only data added since a certain time and other similar queries.

The original database stored procedures are still there, but we discourage their use.

## 14 There is no need to design your database before getting started

AQUARIUS 3.0 can be used right out of the box. There is no need to make database design decisions before installing and starting to use the system.

The database is still customizable, but it can be changed (with some restrictions) after the fact. The following things can be customized:

**Locations:** The built-in Location object in AQUARIUS 3.0 stores enough attributes to make it useful. However, you can define your own attributes (eg "phone number").

**Location Types:** In addition, you can create different types of locations to AQUARIUS 3.0 ( eg "River" and "Lake") and you can define attributes unique to that type.

**Folders:** Lastly, you can define different container objects for collecting locations into meaningful groups, and each type of container can store unique attributes (eg "Basin" and "Catchment")
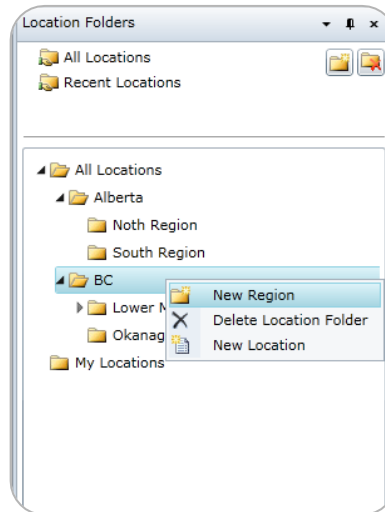
## 15 AQUARIUS 3.0 is backwards compatible with older data

Moving to AQUARIUS 3.0 requires a database migration. You will need to create a new database and set it up with all the new features and settings provided by the new system.

However, time series and rating curves that you created in AQUARIUS 2.7 can be copied directly into the new database and used immediately.

| Column1 | Column2 | Column3 | Column4 |
|---|---|---|---|
| Area | Organization | Comment | Status |
| | | | |
| **Append and Signal Join** | | | |
| 1 | General | Still quite some confusion out there. Append to DB seems to be fine now; but signal join still an issue. We also need to explore what the best practices are for use of whiteboards for repetitive tasks such as appending last week's data to a growing time series. | RESOLVED in 2.7 and 3.0 |
| **Import from File** | | | |
| 1 | General | No big issues in this group but some complications with batch imports. | RESOLVED in 2.7 |
| **Flags** | | | |
| 1 | General | Ability to use letters and/or digits to label flags | RESOLVED - Redesigned |
| 2 | Environment Canada | Exporting flags and the ability to export all flags in Export to File | RESOLVED |
| 3 | Wyoming State Engineer's Office | Reporting on flags and the need to report on flag occurrences, e.g. Flag 7 was present 453 times in this dataset. | RESOLVED (Reporting) |
| **Stats** | | | |
| 1 | General | Daily stats: need to report daily stats starting at a set hour (say 9am). | RESOLVED in 2.7 |
| 2 | National Park Service | The NPS also wants to report on diurnal vs nocturnal stats (ie two reporting periods per day, with start/end hours freely set for each of the two periods). | UNRESOLVED |
| 3 | General | Stats completeness criteria: ability to dial in when a stat is meaningless (e.g. too much data missing or of bad quality in the bin). Both NPS and EC concurred this is crucial. | RESOLVED in 2.7 |
| **USGS Data** | | | |
| 1 | Salt River Project; City of Westminster | Import and processing of Data Portal USGS data: have some way to ingest data from the USGS – either through our portal (painful and very labour intensive); or by special arrangement with USGS. | (RESOLVED - COMMENT) |
| 2 | Wyoming State Engineer's Office | Web Portal: what is the roadmap for further development? Where are we with the list of extra features WYO had requested? | UNRESOLVED - data portal toolbox no longer supported |
| **Grading** | | | |
| 1 | General | Ability to display them in reports. all agree this is necessary. | RESOLVED in 2.7 |
| 2 | General | Confusion between grades and flags: many users still don't understand what is stored in a flag vs what is stored in a grade. Needs clarification. | RESOLVED |
| **Charting** | | | |
| 1 | Wyoming State Engineer's Office; Northern Water | Charting: need to be able to freeze scales on charts so that you can compare charts from month to month (ie no autoscale when new data is used on existing chart). | UNRESOLVED |
| 2 | Wyoming State Engineer's Office | Charting: Charting of Daily means does not display the peaks within the bin for which the mean was calculated. Need some way to overlay the instantaneous Daily max on top of the Daily mean. | UNRESOLVED |
| **Profiling** | | | |
| 1 | City of Westminster | Same scale freeze issue in Profiling. Also, needs the ability to select colour mapping and freeze it (ie pH=6 is always the same colour). | UNRESOLVED |
| 2 | City of Westminster | Ability to work from a fixed bottom reference rather than from top of the water (variable). | UNRESOLVED |
| **Data Correction** | | | |
| 1 | Wyoming State Engineer's Office | Trimming: lower limits don't work with trimming. | RESOLVED |
| 2 | Salt River Project | Better link between table and graph: if a data point is selected on the graph, it should highlight in the table (the opposite already works). | UNRESOLVED |
| 3 | Salt River Project | Display both raw and corrected values in the table. | RESOLVED |
| 4 | Salt River Project | Copy-paste collection of measurements from Excel cells into table: once data has been resampled and empty cells have been created in areas where data was missing, ability to paste a collection of values copied from Excel right into the table in DC. Others agree this would be very useful. | UNRESOLVED |
| 5 | National Park Service | Link between device calibrations and signal corrections: ability to see the calibration work done prior to sonde deployment or during a site visit to define (or even automatically suggest) drift corrections. InSitu seems to have some software to manage pre- and post-deployment calibration sessions (which can potentially be short time series recorded before the instrument was deployed; or after the instrument is brought back to the lab). Maybe such calibration sessions should be tied to the site visits where the instrument was deployed/recalibrated/removed – very much like leveling and benchmark sessions for gauging sessions. | UNRESOLVED |
| 6 | Salt River Project | Resampling : can you set the exact time at which you want the resampling to start? Assume right now the resampling will start from the closest data point time stamp. | PENDING |
| 7 | | Notes (EC): need the ability to enter notes (universal request). And then need ability to report on notes attached to a time series. Which raises the question: should notes propagate? Maybe this is optional (e.g. you can choose if a note propagates or not. For instance, if the note is something like "Bear destroyed sensor" then it should propagate; but "I tried 3 corrections and settled on this one" would not propagate.). | RESOLVED in 2.7 and 3.0 |
| **Export** | | | |
| 1 | Environment Canada, USGS, Wyoming State Engineer's Office, National Park Service | Exporting Corrections: need to export corrections within the CSV file; also, ability to produce a report of all correction applied to a dataset. | RESOLVED in 2.7 |
| **Misc.** | | | |
| 1 | Wyoming State Engineer's Office | Calculation rounding convention: do we use the banker's rounding convention (a la USGS)? | UNRESOLVED |
| 2 | Salt River Project | Can we display wet profiles stacked? | UNRESOLVED |
| 3 | Wyoming State Engineer's Office | Can we process Campbell logger files? | UNRESOLVED |